

CLAIMS

1. A method for processing data for transmission over multiple
2 transmission channels in a multi-channel communication system, comprising:
 - 4 determining characteristics of a plurality of transmission channels available for
4 data transmission;
 - 6 segregating the plurality of transmission channels into one or more groups of
6 transmission channels; and
 - 8 for each group of transmission channels,
 - 8 selecting one or more available transmission channels in the group based
on the determined characteristics and a threshold, and
 - 10 coding and modulating data for all selected transmission channels in the
group based on a particular coding and modulation scheme to provide
12 modulation symbols.
2. The method of claim 1, further comprising:
 - 2 for each group of transmission channels
 - 4 weighting modulation symbols for each selected transmission channel in
the group based on a respective weight indicative of a transmit power level for
the selected transmission channel and derived based in part on the determined
6 characteristics of the selected transmission channel.
3. The method of claim 1, wherein the multi-channel communication
2 system is an orthogonal frequency division modulation (OFDM) system, and wherein
4 the plurality of available transmission channels correspond to a plurality of frequency
4 subchannels.
4. The method of claim 1, wherein the multi-channel communication
2 system is a multiple-input multiple-output (MIMO) communication system, and
4 wherein the plurality of available transmission channels correspond to a plurality of
4 spatial subchannels of a MIMO channel.

5. The method of claim 4, wherein the MIMO communication system
2 utilizes OFDM, and wherein the plurality of available transmission channels correspond
to a plurality of spatial subchannels of a plurality of frequency subchannels.

6. The method of claim 5, wherein each group corresponds to a respective
2 transmit antenna, and wherein the plurality of transmission channels in each group
correspond to a plurality of frequency subchannels for the corresponding transmit
4 antenna.

7. The method of claim 1, wherein each group is associated with a
2 respective threshold used to select the available transmission channels in the group for
use.

8. The method of claim 1, wherein the data for each group is coded and
2 modulated with a respective coding and modulation scheme selected for the group.

9. The method of claim 2, wherein the weights for the selected transmission
2 channels in each group are derived to distribute total transmit power available for the
group among all selected transmission channels in the group to achieve similar received
4 signal quality.

10. The method of claim 9, wherein the received signal quality is estimated
2 by a signal-to-noise-plus-interference ratio (SNR).

11. The method of claim 1, wherein the determined characteristics for the
2 available transmission channels are channel gains.

12. The method of claim 11, wherein, for each group, transmission channels
2 having power gains greater than or equal to a particular power gain threshold are
selected, and wherein the power gains are determined based on the channel gains.

13. The method of claim 1, wherein the determined characteristics for the
2 available transmission channels are received signal-to-noise-plus-interference ratios
(SNRs).

14. The method of claim 13, wherein, for each group, transmission channels

2 having SNRs greater than or equal to a particular SNR threshold are selected.

15. The method of claim 2, wherein the weight for each selected

2 transmission channel is further derived based on total transmit power available for the group in which the transmission channel belongs.

16. The method of claim 2, wherein the weight for each selected

2 transmission channel is further derived based on a normalization factor, which is determined based on the characteristics of the selected transmission channels.

17. The method of claim 1, wherein the threshold for each group is selected

2 to provide high throughput for the selected transmission channels in the group.

18. The method of claim 1, wherein the threshold for each group is selected

2 to provide a highest possible throughput for the available transmission channels in the group.

19. The method of claim 1, wherein the threshold for each group is derived

2 based on a particular target received SNR for all selected transmission channels in the group.

20. The method of claim 2, further comprising:

2 transmitting the weighted modulation symbols on the selected transmission channels.

21. A method for processing data for transmission over multiple

2 transmission channels in a multi-channel communication system, comprising:

4 determining characteristics of a plurality of transmission channels available for

4 data transmission;

6 selecting one or more available transmission channels based on the determined

characteristics and a metric;

coding data for all selected transmission channels based on a particular coding

8 scheme to provide coded data; and

modulating the coded data for all selected transmission channels based on a

10 particular modulation scheme to provide modulation symbols.

22. The method of claim 21, further comprising:

2 weighting modulation symbols for each selected transmission channel based on
a respective weight indicative of a transmit power level for the selected transmission
4 channel.

23. The method of claim 22, wherein the weights for the selected

2 transmission channels are equal.

24. The method of claim 22, wherein the weights for the selected

2 transmission channels are unequal.

25. The method of claim 22, wherein the weights for the selected

2 transmission channels are derived based in part on the determined characteristics of the
selected transmission channel.

26. The method of claim 25, wherein the weights for the selected

2 transmissions are further derived to distribute total available transmit power amongst all
selected transmission channels to achieve similar received quality for modulation
4 symbols transmitted via the selected transmission channels.

27. The method of claim 21, wherein the metric relates to throughput and

2 wherein the one or more transmission channels are selected based on the throughput
achievable for the selected transmission channels.

28. A method for transmitting data over multiple transmission channels in a

2 multi-channel communication system, comprising:

4 determining characteristics of each of a plurality of transmission channels

available for use for data transmission;

segregating the plurality of available transmission channels into one or more

6 groups;

coding and modulating data for selected ones of the available transmission
8 channels in each group to provide modulation symbols;

10 weighting modulation symbols for each selected transmission channel in each
group based on a respective weight indicative of a transmit power level for the selected
transmission channel and derived based in part on the determined characteristics of the
12 selected transmission channel; and

14 transmitting the weighted modulation symbols on the selected transmission
channels.

29. The method of claim 28, wherein the multi-channel communication

2 system is a multiple-input multiple-output (MIMO) that utilizes orthogonal frequency
division modulation (OFDM).

30. The method of claim 29, wherein each group corresponds to a respective

2 transmit antenna, and wherein the plurality of transmission channels in each group
correspond to a plurality of frequency subchannels for the corresponding transmit
4 antenna.

31. The method of claim 28, wherein the data for the selected transmission

2 channels in each group is coded based on a common coding scheme.

32. The method of claim 31, wherein the common coding scheme is selected

2 from among a plurality of possible coding schemes.

33. The method of claim 28, wherein the modulation symbols for the

2 selected transmission channels in each group are derived based on a common
modulation scheme.

34. The method of claim 33, wherein the common modulation scheme is

2 selected from among a plurality of possible modulation schemes.

35. The method of claim 28, wherein the data for the selected transmission
2 channels in each group is coded and modulated based on a common coding and
modulation scheme selected for the group.

36. The method of claim 28, further comprising:
2 selecting one or more of the available transmission channels in each group for
use for data transmission based on the determined characteristics of the transmission
4 channels and a threshold.

37. The method of claim 36, wherein each group is associated with a
2 respective threshold.

38. In a multi-channel communication system, a method for determining a
2 threshold used to select transmission channels for use for data transmission, comprising:
defining a set of code rates, wherein each code rate is selectable for coding data
4 prior to transmission;
defining a set of setpoints, wherein each setpoint corresponds to a respective
6 code rate and is indicative of a target signal-to-noise-plus-interference ratio (SNR)
required for a particular level of performance at the corresponding code rate;
determining a particular number of transmission channels supported by each
8 code rate and capable of achieving the setpoint corresponding to the code rate;
determining a performance metric for each code rate based in part on the number
10 of supported transmission channels; and
deriving the threshold based on the performance metrics for the code rates in the
set, and wherein transmission channels are selected for use for data transmission based
14 on the threshold.
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39. The method of claim 38, wherein the number of transmission channels
2 supported by each code rate is determined by distributing total available transmit power
among the supported transmission channels such that the setpoint corresponding to the
4 code rate is achieved for each supported transmission channel.

40. The method of claim 38, wherein the performance metric for each code
2 rate is an overall throughput achievable by the supported transmission channels.

41. A transmitter unit in a multi-channel communication system, comprising:
2 a controller configured to receive channel state information (CSI) indicative of
4 characteristics of a plurality of transmission channels available for data transmission,
6 segregate the available transmission channels into a plurality of groups, and select one
or more available transmission channels in each group for use for data transmission
based on the channel characteristics and a threshold; and
8 a transmit data processor coupled to the controller and configured to receive,
10 code, and modulate data for each group based on a particular coding and modulation
scheme to provide modulation symbols, and to weight modulation symbols for each
12 selected transmission channel based on a respective weight, wherein each weight is
indicative of a transmit power level for the corresponding selected transmission channel
and is derived based in part on the characteristics of the selected transmission channel.

42. The transmitter of claim 41, wherein the controller is further configured
2 to select a particular coding and modulation scheme for each group based on the
characteristics of the available transmission channels and to provide one or more control
4 signals indicative of the coding and modulation schemes selected for the groups.

43. The transmitter of claim 41, wherein the controller is further configured
2 to determine a particular threshold for each group based on the characteristics of the
available transmission channels.

44. The transmitter of claim 41, further comprising:
2 a transmit channel processor coupled to the transmit data processor and
4 configured to receive and demultiplex the weighted modulation symbols for the selected
transmission channels into a plurality of streams, one stream for each antenna used to
transmitted the modulation symbols.

45. The transmitter of claim 41, wherein the CSI comprise signal-to-noise-
2 plus-interference ratio (SNR) estimates for the available transmission channels.

46. The transmitter of claim 41, wherein the CSI comprise channel gain
2 estimates for the available transmission channels.